The Northwestern MILLER

MILLING PRODUCTION SECTION

American and European Milling Systems; Comparison, Middle Road, Future Trends

U.S. Engineer Compares the Two Systems

By A. M. MARSH

The outstanding difference in the construction and types of roller machines as built in Europe and America are that they are designed for different degrees of work. In the design of the milling system as used in Europe as much as 1¼ to 1½ in. of roll surface per cwt. of flour is used as compared to the American system which uses from ½ to ⅝ in. This is brought about largely by the difference of the construction of roller machines and the speeds at which they operate.

American speeds are higher—550 to 700 RPM—as compared to 350 RPM to 400 RPM on European and English mills. American mills can be successfully operated at these higher speeds because they are designed and constructed accordingly. This is borne out by the basic principles of design, which have been in use for more than 50 years. The differentials are accurately held by "V"-Belt drives connecting the slow and fast rolls. This means of maintaining the differential is quiet and positive and lends itself to the changing of rolls for regrinding or recorrugating. The gear differentials on European and English roller mills which have to use the bastard type of gear tooth are fast being changed to chain differentials. This chain differential gives an opportunity of higher speeds if preferred.

A. M. Marsh

EDITOR'S NOTE: Much has been published in the columns of this journal during the past few months concerning the comparisons between European and American milling methods. In this feature, two milling experts, each distinguished in his own sphere, give their respective points of view. Mr. Donovan visited the U.S. and Canada earlier this year and his article underlines the efforts to adjust a European standard mill to North American capacity standards. Mr. Donovan is managing director of Anaconda Industrial e Agricola de Cereais S.A., Sao Paulo, Brazil.

Mr. Marsh, now retired, was an engineer with the Allis-Chalmers flour mill department and he served his company in many parts of the world, including South America, Europe, England, China, Japan and Russia. He was selected to serve on the first Russian Five Year Plan of industrial rehabilitation and he served two years in that country directing a mill building program. Mr. Marsh's service in this respect underlines the interest aroused in the article on the flour milling industry of the USSR which appeared on page 11 of The Northwestern Miller for Aug. 28, 1956.

Bearings and Journals

The American roll machine is usually equipped with 10 bearings. There are eight bearings on the double roller machine and two on the counter shaft. The European machine has only eight bearings. European journals are very much smaller than the American, due to the fact that the load is much less. (As stated previously, a smaller amount of roll surface is used per cwt. of flour for the American machine, 1¼" to 1½" in Europe as against ½" to ⅝" in the U.S.)

Power Requirements

The small size of the journals in the European roller machine plus the smaller number of bearings, as well as the longer length of European rolls, give some advantage in power saving in the European mill. However, inasmuch as the American method uses less roll area per cwt. of flour, the total consumption of power per barrel is about the same. This was found to be true in comparing the American system of milling with the European in actual operations in China.

Floor Space Requirements

It goes without saying that the amount of floor space taken up by the large European machines necessitates a larger building than the American. The European roll machine is low in height compared to the American, necessitating much stooping to examine the stock. Because of the greater length of European roll machines (sometimes as much as 60 in.) it is necessary to have a very elaborate feeder to distribute the stock evenly over the entire grinding surface. American roll lengths are usually not over 36 in. American practice calls for a machine of greater height, and thus more convenient to operate. Stocks can be distributed as evenly by a single feeder as the European with its elaborate double roll feeder, due to the fact that the grinding rolls are of shorter length.

Bolting or Sifting

The bolting, or sifting, system as used in Europe is what is known as the "plansifter" system which depends on a system of flights on a level sieve to convey material over the bolting system. The machines require large bolting areas for each individual sieve and a much smaller number compared to the American; in other words, for the same amount of bolting area a European machine will have 12 sieves compared to an American high type machine of 27 sieves. A disadvantage of the European system is that accurate separation cannot be made for the reason that one either has too much, or too little, bolting area on the various systems. European millers who have come to America naturally favored European sifters. However, after having tried

(Continued on page 18a)

Miller Describes Application of Both Systems

By HARRY L. DONOVAN

During my recent trip to the U.S. I was asked by leading figures in the milling world to give a few of my impressions of present day milling and future trends. Before starting on these impressions, may I digress to mention how wonderful was the hospitality and kindness I received while in the U.S. In one or two recent theses on comparisons between American and European methods by American millers it was mentioned what wonderful cooperation and hospitality was received by these millers when away from their own country. This I can believe and can say in return that they could not have been better looked after in Europe than I was in the U.S.

I have always had a great admiration for the way in which business is done by our American friends, in other words how they get a move on with things—for example, the tremendous capacity that is got out

(Continued on page 15a)

Harry L. Donovan

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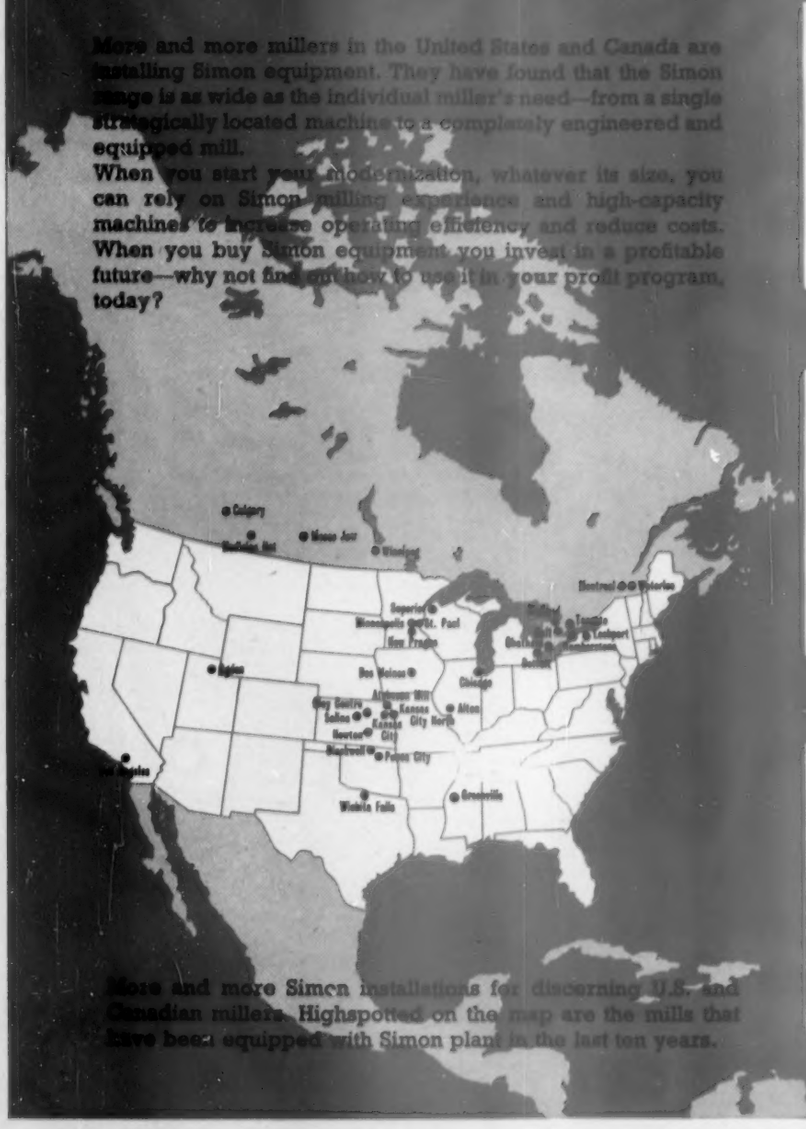

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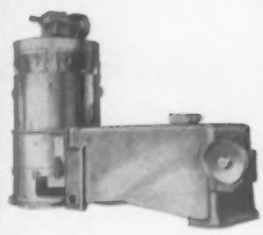

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Food Irradiation:

It Has Limitations . . . Advantages

Will It Alter Food of Future?

EDITOR'S NOTE: The following article on food irradiation is reprinted from "Progress Thru Research," published by General Mills, Inc. Authors, Mr. Andrews is director of food research for GMI and Mr. Emery is a project leader in food research.

* *

The picture of food irradiation has been likened to a boat lying at a wharf . . . with enough steam to toot its whistle once in a while, but not enough to pull away from the wharf.

On the other hand, publicity over the past year or two has indicated that ionizing radiation would soon put canning companies out of business, and housewives would be junking refrigerators and home freezers.

More recently the starry-eyed optimists have been mellowed by food scientists' reports outlining a number of perplexing barriers to food irradiation success. And the pessimists have come around to the idea that the process does have some valuable applications which are within reach technically, and that its future is virtually certain to be one of expanding uses.

D. F. Emery

J. S. Andrews

APPROXIMATE LETHAL DOSES OF IONIZING RADIATION			
	Rep. *		
Man	600		
Insect	25,000	TO	100,000
Mold	100,000	TO	1,000,000
Bacteria	1,000,000	TO	3,000,000
Viruses	3,000,000	TO	5,000,000

Actually, the process itself is not new at all. Since shortly after the discovery of x-rays in 1895 it has been known that ionizing radiation can kill molds, bacteria, insects, and, of course, any animal life. Some 25-30 years ago x-rays and radium were being used to kill living cells, particularly cancer cells.

Radiation research has developed into a large-scale effort just since World War II when high-intensity radiation sources became available.

At present some 50 governmental, academic and industrial laboratories are investigating the problems and applications of food preservation by irradiation.

Research workers are just on the threshold of learning in detail the why's and what's of the effects ionizing radiation has upon food materials. The effects actually vary a great deal according to the intensity of the treatment. For example, insects are killed at a relatively low dose; at higher doses microorganisms such as bacteria, molds and yeasts are destroyed. (The susceptibility of man to radiation, as indicated in the accompanying table, accounts for the extreme safety measures required in using radiation as a laboratory tool.)

As the amount of radiation is increased it alters food molecules more and more severely, resulting in changes in flavor, odor, color and texture.

Of the work carried out so far the most promising applications seem to lie in the area of low-dose treatment.

It has been found that a radiation dose of about 20,000 *rep** will prevent sprouting of potatoes and other tubers in storage. Since sprouting so often occurs in the storage of these foods, resulting in considerable losses, potato raisers, handlers and processors alike are watching irradiation progress with a hopeful eye.

*The rep is a unit of doseage, or quantity of radiation. It is an abbreviation of the term roentgen-equivalent-physical. It represents an energy absorption of slightly less than 100 ergs per gram of material of unit density, and may be regarded for purposes of this discussion as approximately equivalent to the roentgen.

Potatoes Treated

Potatoes have been treated successfully in the Atomic Energy Commission's materials testing reactor at Arco, Idaho. And AMF Atomics, Inc., a subsidiary of American Machine & Foundry Co., is currently developing a portable rig for irradiating potatoes in the field, as they are harvested. Tests have shown that the storage life of potatoes can be extended from a few months to well over a year.

POTATOES—One of the most immediate applications of irradiation of foods is keeping potatoes and other tubers from sprouting in storage. (See photo.) This can be achieved with a dose of only 20,000 rep.

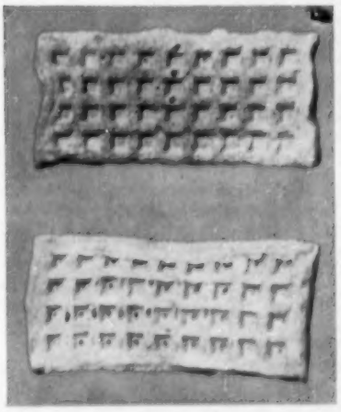
If successful, this use of radiation obviously will mean that farmers can hold back part of each crop for higher prices, railroads will be spared the headache of the whole crop being dumped on the transportation network at the same time, and processors can be assured of year-long supplies. A dose as low as 20,000 rep does not cause flavor damage.

Low-dose treatment also shows promise in such uses as killing trichinosis parasites in pork, and in deinfestation of grain and cereal products. As indicated in the table, it is possible to eliminate insect life with a radiation dose of 25,000 to 100,000 rep. It appears that this process may have several advantages over the deinfestation methods now used.

In this area one particular interest of the U.S. Army Quartermaster Corps is in the elimination of infestation in cereal bars used as field ration for the armed forces. The low doseage required for this purpose would not cause flavor damage.

Irradiation at low-dose levels appears to be a good bet in extending the storage life of a number of food products in combination with refrigeration.

It has been found that a dose of only 100,000 to 200,000 rep can often



WAFFLES — Darkened, non-irradiated waffle at top is due to mold. Waffle at bottom has been treated with 250,000 rep of radiation, enough to prevent growth of mold.

YEAST ROLLS—The yeast rolls above are examples of the lethal effect of radiation on molds. Yeast roll to the right was irradiated with 250,000 rep. Before treatment both samples were sprayed with a water suspension of mold spores. Results of baking bread from flour irradiated with high doses leave much to be desired. (See photos of bread slices.) Loaf at left is non-irradiated control; middle loaf, somewhat discolored and low in volume, was baked from flour irradiated with a dose of 1 million rep; "loaf" at right is a complete failure—flour was given a dose of 4 million rep.

AND THEN THERE'S FREEZING, TOO

Irradiation is but one way science and industry try to thwart deterioration of food. Barely 25 years ago the multiple quick-freeze process pioneered a revolution in countless aspects of the food industry. By 1953 it had fostered packing of 3½ billion lbs. of food valued at $1.2 billion. By 1952 frozen baked goods was one of the "hottest" topics in the industry. Frozen pie crust, Danish dough, refrigerated biscuits, bread and even cheesecake were being frozen successfully.

reduce the number of bacteria and molds in a product by 95 to 99%. (A typical bacterial count reduction curve if shown on a graph, with the count plotted in against the radiation dose is evidence that a rather low dose achieves a high degree of "kill.")

After processing in this manner the food can be kept in the refrigerator for a much longer time without spoiling. Here, too, the dose is low enough so that little or no flavor change occurs and the other problems become relatively minor. Examples of the advantages of this treatment are shown in the accompanying pictures, where a small dose of radiation has prevented mold growth on waffles and rolls. The untreated samples, however, are quite moldy.

The U.S. government reports that pasteurizing amounts of radiation kill enough bacteria to lengthen the refrigerated shelf life of some two dozen food items with no major changes in flavor or odor. According to the report, treatment may eventually extend the refrigerated storage life of beefsteak, lamb, fish and tomatoes by as much as 5 to 10 times.

In experiments at the Massachusetts Institute of Technology, several food items were treated at radiation levels that would destroy all types of bacteria normally capable of growing at temperatures below 40° F. At this level, sausage patties kept better under storage at 36-40° F. than they did when stored at 0° F. without radiation treatment. Storage life of spinach was similarly extended.

The storage life of ground beef at 36-40° F., according to M.I.T., was extended about 12 weeks by irradiation, but 0.3 percent sodium fumarate and 0.3 percent monosodium glutamate had to be added to eliminate off-flavor caused by the radiation. Irradiation also improved the storage life of frankfurters considerably, but again, it was necessary to minimize the development of off-flavor by incorporating 0.25 percent sodium ascorbate into the product.

Radiation Damage

For the U.S. Army Quartermaster Corps, food damage caused by radiation is less of a problem than it is with commercial food companies. The Quartermaster Corps, faced with keeping troops well fed under field conditions, feels that slight radiation damage can be tolerated in field rations, and can therefore treat food with higher doses. On the other hand, even the slightest damage is prohibitive for food companies which must satisfy the quality-minded housewife as she meticulously makes purchases from the grocer's shelves.

When food preservation by irradiation first appeared feasible, the most exciting hope was in complete sterilization. It is true that foods can be sterilized by irradiation. But the big problem scientists are facing, as indicated before, is change in flavor, odor, color and texture—the result of radiation altering the make-up of food molecules. These changes occur principally by ionization—the removal of an electron from the atoms, resulting in a free electron and an ion. That is, as radiation energy penetrates food material, it displaces electrons from some atoms. In other cases the atoms or molecules are not necessarily ionized, but are elevated by the radiation to a high state of activity. At very high doses even food enzymes are inactivated.

The change in flavor is an undesirable one, and it is so severe at radiation dose levels required for sterilization that is seems very improbable that any radiation-sterilized food would be acceptable from a flavor standpoint, at least until some major research gains are made.

Although a sterilizing dose of radiation is usually considered to be one to three million rep, many foods undergo a change in flavor which makes them objectionable to taste when irradiated with as little as 250,000 rep. As the radiation dose is increased, the flavor damage is greater, with many foods becoming unacceptable at 500,000 rep or above. Even this dose is much below that required for sterilization.

The quality and intensity of the off-flavor are somewhat dependent upon the type of food, but there is a rather common characteristic. Researchers, in trying to describe the damage, have come up with such terms as "scorched," "goaty" and "wet dog" — descriptions which certainly do not lend themselves to enhancing appetites.

In odor changes, a situation exists that closely parallels that of off-flavor development. Flavor and odor damage is quite similar in quality, intensity and occurrence.

Color changes also occur, and they are of two general types. Cereal products and milk products often undergo a darkening or browning. Many meats and vegetables (highly pigmented items) are bleached somewhat. Color change is really serious only in the high-dose regions, and it is not as universal as in the case of flavor damage.

In a few cases there is also a change in texture. Some fruits and vegetables, such as tomatoes and celery, become soft. Lettuce wilts

under treatment. Changes in texture are not frequent, however, and they do not generally present a serious obstacle.

Baking Damage

Although it is impossible to demonstrate the flavor or odor problem visually, an indication of the damage to baking characteristics and the change in color may be obtained from a comparison of the bread baked from irradiated and non-irradiated flour (picture on page 3a).

Actually, proteins, fats, carbohydrates and vitamins are susceptible to varying degrees of radiation damage. These effects are primarily oxidative in nature, and a few of the major changes which are now known may be cited.

Proteins undergo partial denaturation. In the case of fats, there is partial destruction of natural antioxidants and increased peroxide formation. Carbohydrates are slightly depolymerized and several oxidation products are formed. Vitamins undergo partial inactivation.

Enzymes are essentially unaffected in the lower dose ranges. An extremely high dose is required to inactivate enzymes—so high that drastic undesirable effects upon the food occur. Since with many foods enzyme inactivation is essential to permit long-term storage, particularly at room temperature, it is apparent that heat or some other preserving process in conjunction with irradiation will be required in some cases to realize long-term storage.

A report from the Department of Horticulture, Purdue University, mentions that radiation sterilization might bring about a more rapid deterioration of food substances by rendering proteins more susceptible to hydrolysis by certain enzymes, while at the same time failing to inactivate these enzymes.

Further subtle changes are produced in some of the components of food which are necessary for adequate nutrition. These changes involve chemical alterations which do not necessarily change the nutritional value of the food. It must be proved, however, that irradiated foods are completely wholesome and safe before the technique can be applied to consumer foods.

When the problems of off-flavor and the necessity of ascertaining nutritional adequacy are considered, it becomes evident that any use of radiation for food preservation will require several more years of research and development.

The problems of sterilization doses are so perplexing that this does not at present seem to offer any great promise for treating human foods. It appears that no applications at even pasteurization levels could be expected until 1960 or later.

Of course, some new, dramatic discovery involving a modification of the irradiation process could change the over-all picture completely. However, most attention, and optimism, is now being directed at uses of low-dose treatment.

Radiation treatment is often referred to as "cold sterilization" since only a slight temperature rise occurs when food is irradiated. This factor suggests the possibility of sterilizing foods which cannot be treated with heat.

It is interesting to note that the extent of the damaging chemical changes due to the higher dose levels of radiation is very small in the dose range up to two or three million rep. It has been estimated that with doses of this magnitude, actual chemical change involves less than 1/100 of a percent of the chemical bonds in any product. The change is so slight that usual analytical methods seldom detect them.

This much of a change would not appear to be sufficient to cause nutritional inadequacy. But it is a question that will have to be proved conclusively, along with another one equally or more important—whether radiation causes toxicity in foods. The one way to find the answers is the feeding test, whereby irradiated foods are fed to animals and their biological and physiological performance is closely followed.

Animal Feeding

A large number of animal feeding tests have been conducted or are presently in progress. There has been no indication of any toxicity in the results of these tests. And no significant difference in nutritional performance between irradiated foods and normally-processed foods was observed.

A test involving the feeding of partially-irradiated diets to human volunteers is presently in progress at Fitzsimmons Army Hospital. Preliminary results show no adverse effects, but final test results are eagerly awaited, since they should provide valuable information concerning the safety and wholesomeness of irradiated food.

There is one other possible problem area which might well be clarified. There has been some popular misapprehension that any treatment of food with ionizing radiation would cause it to become radioactive. With the radiation sources now being considered for food treatment, this danger has been shown to be both

(Continued on page 12a)

SEND FOR FREE COLOR POSTERS

The three posters illustrated above are available in color, to help you dramatize the specific benefits of enrichment ingredients—Niacin, Vitamin B_1, and Riboflavin. These posters are part of the Merck program to make homemakers more conscious that the word "Enriched" on flour or bake goods means extra vitamins for better health. For a free supply of these colorful posters, ask your Merck representative—or write direct to Merck & Co., Inc., Rahway, New Jersey.

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No. 5517—Pneumatic Conveyor

Sprout, Waldron & Company, Inc., has released a new piece of literature, bulletin 154, which describes the new, complete package unit pneumatic conveyor, called by the trade name Airo-Flow. The two-color folder introduces the model CM-203 vacuum system for car and truck unloading which can also be used as a pressure system for general material transfer. All the principles of operation and the general construction of the unit are outlined in the bulletin, as well as general dimensions and specifications. Copies of bulletin 154 may be obtained by checking No. 5517 on the coupon and mailing it to this publication.

No. 5518—Net Weighing Machine

A new automatic net weighing machine has been announced by the Exact Weight Scale Co. Company officials state that "the machine incorporates an even balance 1 to 1 ratio precision industrial scale with visual indicator; smooth operating net weigh hopper and automatic cut-off controls with efficient material handling equipment. The over-under indicator for visual checking eliminates need for a separate checkweighing operation. Calibrated adjustments with counterweights of known value, graduated beam and poise and scale indicator make this an ideal weighing machine for packaging, sacking or batching." Two models, one for weights up to 3 lb., and the other from 3-10 lb., are available. Secure more complete details by checking No. 5518 on the coupon and mailing it.

No. 5519—Insecticide

The Pest Control division, J. I. Holcomb Mfg. Co., Inc., is producing a new concentrated insecticide which the company recommends for use as a grain protectant. The product mixes with water to produce a spray claimed to be non-toxic and safe to use around all foodstuffs. The product, known as Insekil E. C., contains pyrethrins and piperonyl butoxide, and is said to produce quick knockdown and kill of a large number of flying and crawling insects. Gallon and quart size containers are being used. For more information check No. 5519 on the coupon and mail it to this publication.

No. 5520—Floor Cleaner

Multi-Clean Products, Inc., has introduced a new lightweight 12-in. floor cleaning machine known as the Lite 12. It weighs 35 lb., and is said to be ideal for areas up to 2,000 sq. ft. Helical gears revolve on ball bearings, insuring positive drive and quiet operation, the manufacturer claims. The gear unit is lubricated for life and requires no maintenance. The machine has a full 12-in. brush spread with a speed of 175 rpm. It is powered by a ½ h.p. industrial type motor. Secure more complete details by checking No. 5520 on the coupon and mailing it to this publication.

No. 5374—Dust Collectors

The problem of eliminating dust nuisance at its source and returning the dust to the system without subsequent handling is described in a four-page color bulletin on dust collectors issued by Omega Machine Co., Division of B-I-F Industries, Inc. The bulletin contains photographs, installation and dimension diagrams plus descriptive information telling how the firm's dust collectors are designed to prevent escape of dust that attends the filling of hoppers, chutes, bucket elevators or screw conveyors. Where the collectors may not be mounted directly over the bin, chute or hopper, such units are either wall mounted or mounted on a floor stand, the bulletin explains. The standardized, self-contained dust collectors are built in two sizes, each with low speed (1,725 r.p.m.) or high speed (3,450 r.p.m.) fans to accommodate the majority of applications, it is explained. Secure more complete information by checking No. 5374 on the coupon and mailing it.

No. 5524—Product Handling

The King & Hamilton Co. is now producing the "King-Matic" line of product handling equipment. The line is especially adapted for moving products in feed plants, seed corn and seed plants and grain elevators, it is claimed. The company also handles the "Ottawa" line of farm equipment. A catalog illustrating and describing the product handling line is available by checking No. 5524 on the coupon and mailing it.

No. 4055—DC Amplifying Instrument

A recently-introduced direct current (DC) amplifying instrument is described in a four-page data folder produced by the Fielden Instrument division of Robertshaw-Fulton Controls Co. The folder contains descriptions and schematic drawings of four typical applications of the instrument, as well as general technical information concerning voltage and current amplification. The DC amplifier is suitable for most industrial direct current measuring problems, according to the company. It is electromechanical in operation. The unit is housed in a small case of cast aluminum and rubber gasketed to prevent dust, water and other foreign matter from entering. Special models for installations where resistance to weather and other hazards is important also are described in the folder. The folder, titled Data Sheet No. 80-1, will be sent if you will check No. 4055 on the coupon and mail it.

No. 5536—Valve Bag Packer

A brochure on the valve bag packer, trade named the Black Diamond Airflow packer, has been prepared by the Black Products Co. The packer makes use of the fluidizing principle of conveying material, the brochure states. The principle is combined with the weight of control mechanism heretofore found in the firm's screw type packer. The brochure states that a firm with a packing problem may submit all pertinent details such as the nature and characteristics of the product; the weight of the bags to be packed; the desired bag filling rate per hour; the weight variation per bag that will be permitted, and other information to the company for consideration. The packer is capable of filling bags weighing from 10-125 lb. packed weight. Secure the brochure by checking No. 5536 on the coupon and mailing it to this publication.

No. 5539—Stream Splitter

Sprout-Waldon & Co., Inc., announces that its product, the Richmond Sprout-Waldon stream splitter is a compact unit used to divide a single stream of dry, free-flowing material into two to eight separate uniform streams. The company's announcement states: "Material enters the top of the unit where it strikes an impeller which is rotating at approximately 300 r.p.m. The impeller agitates material into a continuous whirl which settles evenly in the various outlets. Leather brushes on the lower end of the drive shaft sweep material into outlets. The capacity of the stream splitter varies according to the nature and weight of the material being handled. The unit has a heavy gauge steel housing with two dust-proof clear plastic observation windows. It has a flanged top inlet and the required number of outlets. A one-piece, stainless impeller and leather brush assembly are mounted on the drive shaft inside the housing. The unit is V-belt driven from a ¼ or ⅓ h.p. motor and has a safety relief clutch with shear pin." For literature describing the unit in more detail check No. 5539 on the coupon and mail it to this publication.

No. 4053—Flour Milling Equipment

Sprout, Waldron & Company, Inc., has announced publication of a new bulletin, No. 162, which gives general information about Buhler flour milling equipment and systems. Buhler milling equipment, which is foreign-built, is available in the U.S. through the Sprout-Waldron sales organization and is serviced by the latter company. The bulletin includes sections on pneumatic systems, purifiers, roller mills, washers and sfoners, high capacity sifters and impact finishers. For a copy of the bulletin, check No. 4053 on the coupon and mail it to this publication.

No. 4054—V-Belts

The origin, history and development of the modern multiple V-belt drive is discussed in a new 36-page pocket size booklet released by the Allis-Chalmers Manufacturing Co. A copy of the booklet is available by checking No. 4054 on the coupon and mailing it to this publication.

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Evaluation and Standardization Of Bread Grain

By DR. WERNER SCHAFER

EDITOR'S NOTE: Dr. Schafer is a member of the staff of the Federal Research Institute of the Cereal Industry in Detmold, Germany. The accompanying paper was delivered by him at the recent meeting of the International Milling Association in Paris. Dr. Schafer visited the U.S. earlier this year and attended the technical conference of the Association of Operative Millers at Dallas.

v v

There are only a few spheres of the grain industry which have experienced in science and practice such divergent and contradictory criticisms as the evaluation of bread grain. On one hand, the necessity for an exact scientific foundation of the grain value by means of relatively simple methods is not only acknowledged, but is requested urgently in all branches of grain economies in all countries of the world and for all kinds of grain. On the other hand, there is still obscurity, in what way, with which materials, by which means and from which aspects the evaluation should be performed. The person who has no real knowledge of the whole subject will think it sufficient to state "quality" objectively, but the expert will here put the question: what does quality really mean?

With this short summarizing view, we have already pointed out the basic problem, which has to be solved by everybody dealing scientifically in technique and in practice with the evaluation of bread grain. The problem includes the solution of five topics:

(1) Establishing and developing a general, acknowledged terminology of precisions and definitions.

(2) Selection of quality factors being necessary, it is indispensable for the evaluation and exact reproducibility by experiments.

(3) Development and application of working prescriptions exactly worked out and carefully and clearly formulated, to be used for the performance of the analysis admitted as necessary for the evaluation.

(4) Development and application of a standard apparatus to be used only for standard methods.

(5) Development of "standards" reflecting the real yield value of grain.

Grain Evaluation

It is obvious that the aspects by which grain characteristics shall be evaluated are of different nature. The farmer, and to a certain extent the breeder, will deal in the first line with the wheat plant; necessarily they will be interested, above all, in the national agricultural value of their products. It would be illusive to have in this case other claims. But grain production is not an end in itself. Cereals are not consumed directly by men. Men eat bread. Therefore, grain converting reaches the same rank of evaluation as agriculture, and we can only get a perfect idea of the characteristics of a cereal variety by its properties for growing

U. S. TIGHTENS MINIMUM SANITARY MILL LIMITS!

New Levels Effective During 1956 Crop Year

BASIS OF LEGAL ACTION 1% OF INSECT DAMAGE

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The basis of legal action on filth-contaminated wheat was lowered to the following:

1 or more rodent pellets per pint of wheat (liquid measure) or 1% or more of insect-damaged kernels.

The announcement was made last year and the change was put into effect July 1, 1956, to coincide with the beginning of the crop year, and thus permit time for the Grain Trade to make necessary adjustments.

These levels will be applied in random sampling of cars of wheat.

Excerpt from U.S. Health, Education and Welfare Food and Drug Administration Bulletin M2715

WASHINGTON, D. C.—The Food and Drug Administration has announced that it will tighten sanitary requirements on wheat beginning July, 1956, to promote increased cleanliness in the Nation's food supply.

George P. Larrick, Commissioner of Food & Drugs, stated that during the period January through July 31, 1955, wheat from 3,754 cars was examined. Of these, 29 cars were found to contain filth in excess of the rodent actionable level, and 3 cars showed insect damage to the extent of 2% or more of the kernels.

The Commissioner said: "Under the Program, substantial progress has been made in improving handling and storage of wheat to prevent contamination. However, experience acquired during the past six months shows that the levels of judgment should be tightened if the program is to continue to be effective."

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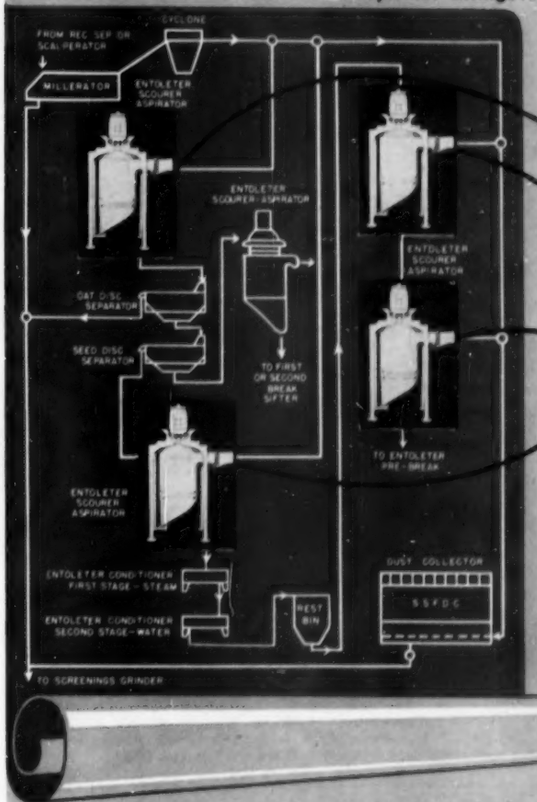

Fragment Count per 50 grams:

290

157

180

250

The majority of these fragments were larvae which prove that the "ENTOLETER" SCOURER-ASPIRATOR is removing the hidden infestation plus plugs... from the kernels.

We guarantee that "ENTOLETER" SCOURER-ASPIRATOR . . . effectively controls internal infestation with a REDUCTION in material lost to screenings . . . with desirable polishing action . . . and without over-scouring.

* *The flour being produced on this mill averages less than 2 fragments per 50 grams.*

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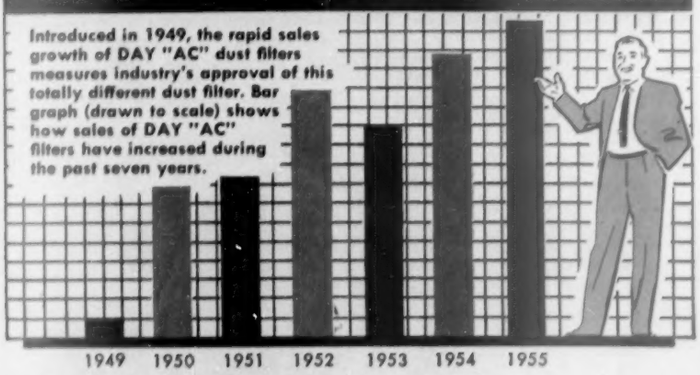
HAVE EARNED INDUSTRY'S ACCEPTANCE


Introduced in 1949, the rapid sales growth of DAY "AC" dust filters measures industry's approval of this totally different dust filter. Bar graph (drawn to scale) shows how sales of DAY "AC" filters have increased during the past seven years.
1949
1950
1951
1952
1953
1954
1955

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● NEW DESIGN FEATURES—The Hersey principle of reverse jet cleaning, DAY self-adjusting blow rings, sanitary square-to-round air inlets, automatic-continuous operation, superior filter media, are just a few of the features introduced by DAY.

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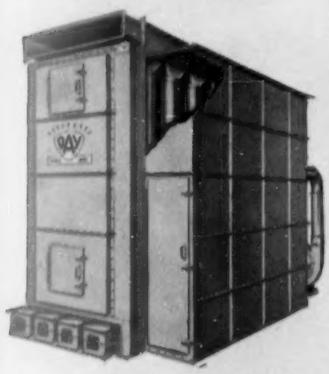
● NEW LOW INSTALLATION COSTS—Unit sub-assembly saves time and money—up to 75% on filter erection costs.



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and for converting. We wish to concentrate here solely on the converting of bread grain, and to ask ourselves which general notions we are to consider for their evaluation. Just as for other materials, there are in the cereal sphere three basic points to discriminate:

(1) **The Nutritive Value.**

It plays an eminent part for evaluation of the foodstuff grain within the framework of the whole human nutrition. But for evaluation of different bread grain varieties or respectively of different origins it has been seldom investigated thoroughly Therefore it must be compulsorily rejected from our further considerations; we state, however, that this fact is a gap in research, and when it will be filled, we may certainly acquire some new and very interesting knowledge.

(2) **The Yield Value or the "Quality" in a More Restricted Meaning.**

It has proved useful to limit the term "quality" to those properties which determine genetically the converting value. The frame of this limit can be easily drawn. Cereals are to be milled, flour shall be baked: It is the grading value and baking strength which are to be considered. Unfortunately, the usual terminology

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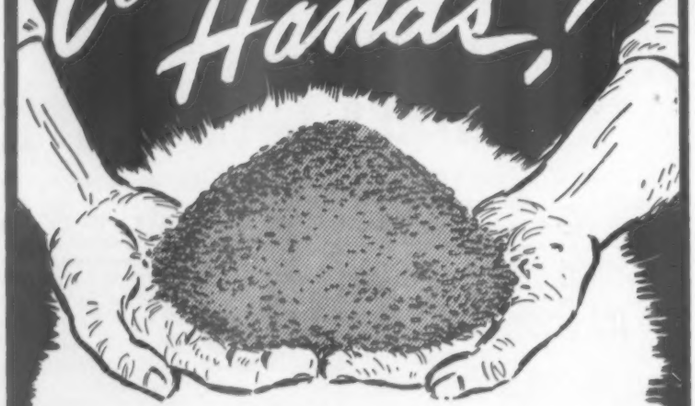

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does not account sufficiently for this postulate, which seems so obvious in itself. In most cases we understand by quality only the baking properties of wheat. We should not, however, neglect the important factor of milling value and flour yield; all the more as it is easily possible to state this factor numerically in a rather exact way. It is known that this last element is not available with the factor of baking strength.

(3) **The External Conditions.**

Besides the quality in compliance with the nature and constant within certain fluctuations, the external condition of a cereal lot may possess significant technological differences. They are expressed by those factors which—although they influence the results of the converting but do not depend on the variety or on the nature—constitute factors which may be modified by external acts. Therefore, the whole of the "external condition" includes the moisture content, impurities, soundness and the color.

Quality Factors

Quality (yield value) and external conditions determine the technological evaluation of a cereal lot. Unfortunately there are no means by which to fix clearly both factors with only one working scheme or with only one test. It is nevertheless indispensable to characterize particularly the quality by several tests, independent of one another, but comparable between themselves.

(1) **The Determination of Quality.**

(a) Grinding Value—The two most important criteria of grinding value are semolina yield and flour yield. Their determination is closely bound to the existence of a suitable laboratory milling equipment (Buhler, Allis-Chalmers, MIAG), among which the Buhler laboratory automatic mill is the most well known. The milling test exactly performed under constant atmospheric conditions by a qualified engineer is the preliminary condition for the extensive evaluation of a wheat variety, as of a grain lot prepared for milling. Some analytical proceedings may illustrate and clarify the result of the milling test without being able to replace it. Above all, let us mention determination of grittiness, which allows fairly good conclusions on semolina yield and baking strength. The hardness of the endosperm is another evaluation factor of great importance, as the usual distinction between "soft" and "hard" wheats—whereby always confusions are to be feared between "hard" and durum wheats—is only clumsy and leads often to many misunderstandings. The result of grinding is finally influenced by the kernel size, by the bran proportion, by the stability of the cohesion between the bran and endosperm and by the depth of the crease.

I emphasize that all these factors mentioned are only indications of the grinding value, similar to the gluten content for the baking quality, and that in each case, the milling test is required as being the "experimentum crucis."

(b) Baking Qualities—The principle of selection is in this case the same as in the grinding value factor; the baking test is the decisive test proceeding which also may be completed, explained and directed by the results of analytical statements. The problem itself, however, is difficult to realize, especially by reasons of definitions. The term baking quality means nothing, as long as the "baking purpose" is not clear. If we stick to the notion of baking quality for bread making, we can make fairly good conclusions from the data of protein content, of gluten content, gluten quality and maltose content on the baking quality of the wheat flour. If, however, we extend our considerations to the variety of baked goods we know, we face new evaluation aspects which cannot at all be classified in the simple scheme of bread quality. New factors become decisive: Particle size, purity, toughness of dough, adhesive power; but these are only auxiliary means in completing the baking test.

(2) **The Determination of the External Conditions.**

(a) Moisture Content—Among the problems of the determination of moisture content of grain three main points have come in evidence within the last three years:

The definition of the notion of "moisture content."

The use of the validity limits of electric apparatus.

The maximum temperature allowable when using the hot-air dryer method.

The development in the practice of the cereal industry shows a significant trend for rapid but sure proceedings; the numerous and very promising apparatus now on the market will prove suitable when a generally acknowledged standard test or gauge method on vacuum basis will have been fixed and which will eliminate, as far as possible, test errors and substratum peculiarities.

(b) Impurities—The importance of the impurities as a quality evaluation factor is nowhere in question. The definitions offer some serious difficulties, but practice has proved that methods can be found easily once the definitions are settled. Within the last years, the nature and degree of the changes in the quality value due to the different components of the impurities have been fixed on very wide scale so that the evaluation of

● At the check-out counter of a supermarket, a member of a research team asked a lady if she'd mind answering one question. She didn't mind.

"Why do you buy X brand of flour?"

"Well, white flour all seems pretty much the same today, but *this* brand clearly assures you that vitamins have been added. See, it tells you plainly on the package 'ENRICHED FLOUR' and lists the vitamins. We buy enriched bread and other foods with vitamins—so I say why not get that health advantage in the flour I use?"

The lady is absolutely right, and millions agree with her. That's why "ENRICHED" is a selling word.

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impurities has found a safe scientific basis.

(c) Soundness—In any case, the soundness of grain may influence its converting. The proceedings for this, in first line the acidity, germinating power and the proof of heat damage have been controlled methodically; the evaluation should not, however, be limited to the mere statement of the damage, but should also show the possibilities of a remedy or of an optimum use.

Standardization

The quality testing of grain is based on a comparison of the individual analysis with the figures empirically obtained. So the reproducibility of the individual analysis is therefore in close connection with the validity of the test itself. This reproducibility is given by most of the usual methods, and we may confirm with good reason, that the analysis itself, i.e., the pure laboratory working technique, has developed in such a way, that great mistakes are as a rule excluded. The unification of the various ways of working, however, is now, as before, a problem which cannot yet be solved either in Europe or America, and we cannot attach enough value to the imperative statement that "without this unification of methods, all our scientific grain research rests on an unsteady and uncertain basis."

I do not intend to extend this statement to the methodical details—this is the task of the International Organization for Standardization of Research Methods for Cereals which was established during the Third International Bread Congress in 1955 in Hamburg. It is in this organization that six working sections are busy with the following problems: Sampling, protein content, ash content, moisture content, impurities and documentation. The general secretary's office of this company is situated at Vienna, Austria. Its tasks are: (a) To function as information office in connection with the existing national, regional and international organizations. (b) Establishment of a documentation center for all questions of standardization and normalization. (c) Publication of the proposals of the individual working sections as "standard methods." (d) Organization of periodic conventions.

It is obvious that the activities of the organization will gain importance. The still prevailing anachronism, i.e., those methods, which as basis of the evaluation influence the economic basis of the whole grain industry, are performed according to the arbitrary and traditional experiences of the various institutes and laboratories, according to the technical system of 1875. This anachronism has proved unbearable. It is harmful to the reputation of science and the scientist and is absolutely irrational and hostile to the practice of the whole grain industry of the world. The intensity of this comprehension in all professional spheres makes us hope that its achievement is only a question of time.

A consequence in this connection must not be forgotten, because it influences directly the result of the efforts undertaken; without standard apparatus there is no standard method possible. It is obvious that this postulate will meet with serious opposition, quite understandable in some particular cases, as well as regarding national restriction as international agreement. But the solution of this problem is a question of mere practice; we cannot go into details here. The problem itself must, however, stand in the center of the general attention for all theoretical discussions and practical proposals.

As soon as the methodical problems are solved and the preliminary laboratory work is done, it will be possible according to the general requirements to satisfy the formulation of the technical necessities, i.e., to develop cereal standards which are more than diagnostics of identity. The aim of all standardization and also that of the grain standard is to establish a code of evaluation scales which will be understood readily by the grain exporting countries. What has not been understood—consciously or not—is the dualism before mentioned between the evaluation scales and the necessarily different views of the farmer, the trade and the consumer. Favored by the weight of economic positions, perhaps also by a certain ignorance of technological state of things, the grain standards did not reach the rank of general evaluation scale, but remained primitive auxiliary means, for a gross statement — I admit — of conditions and identities.

Nevertheless, the general technological necessities may, according to what has been said previously be formulated objectively, even in detail. Nobody will deny there are general and objective differences between different grain samples which cannot be influenced by any change in the considerations of trade politics or rules of the market, or technological differences between the various lots of cereals. We shall try to express these requirements.

(1) **What is Required for Quality.** For general evaluation in the international cereal trade, the protein content ought to be first introduced. Considering that the characteristics of some cereals of certain

(Continued on page 17a)

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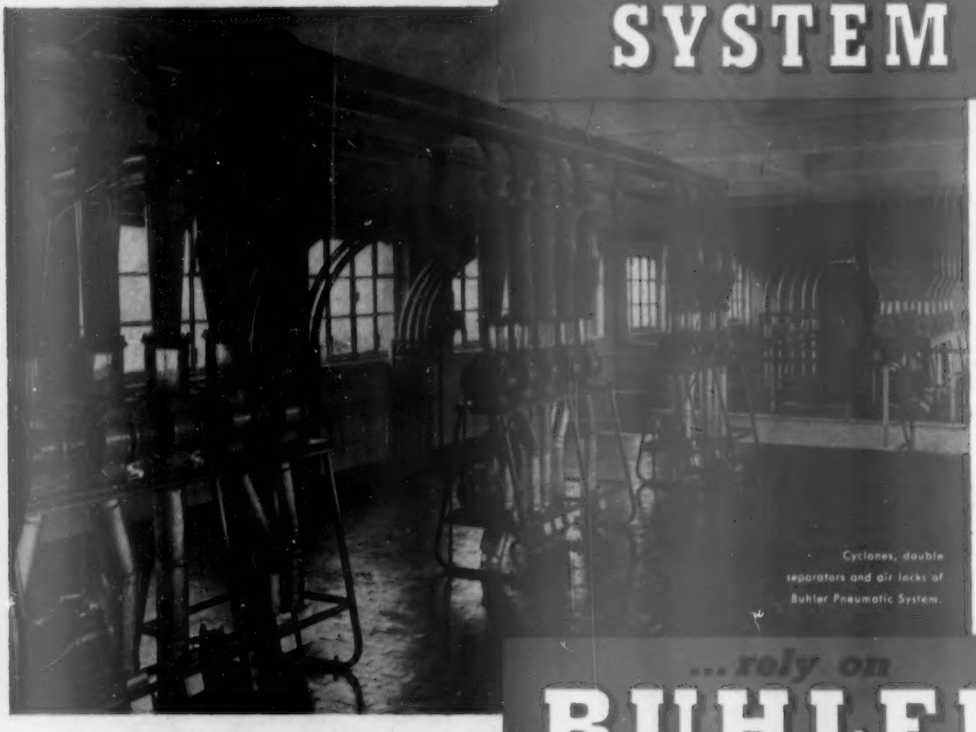

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U.S., European Chills Covered At AOM Meet

By Frank M. Schneider

EDITOR'S NOTE: The following paper was read to the members of District 4 of the Association of Operative Millers in Minneapolis recently by Frank M. Schneider, president and treasurer of Twin City Machine Co., roll grinding and corrugating general machinists.

The subject of rolls and the characteristics of the various makes are very much involved and I shall not attempt to give any documentary statistics, but rather a short resume of the history of chills and our experience with various makes.

There are two techniques which are popular in the making of the chilled iron rolls. One is the static cast in which the hot molten mix is introduced or poured into the metal mold usually starting at the bottom and bubbling up to the top and the metal cooling rapidly at the sides or outer edges to create the hard outer surface. The other general method is centrifugally casting the chills. In this method, the molten metal is introduced into revolving molds and the centrifugal force pulls the metal to the outer surface to be rapidly cooled or hardened.

For many years Allis-Chalmers Mfg. Co. made a good static cast chill, and then at the close of the last war worked with U.S. Pipe and Foundry Co. in developing a centrifugally cast dual metal chill. They spent considerable time and money experimenting with various mixes and combinations before arriving at their standard. Allis states that the hard outer shell of their rolls consists of iron carbide and pearlite metallurgically bonded to a gray iron core. U.S. Pipe makes the chills and they are sent to West Allis for rigid inspection and tests before the "Allis Circle Chill" stamp is affixed. These chills vary in hardness from 68 to 80 Shore Scleroscope.

U.S. Pipe and Foundry Co. makes the same type of chill under their own name. The depth of the hard outer chill is from ⅛" to ⅝" on the radius, which means that the roll is about 1" under the nominal diameter before the danger of the soft iron is reached. On special order, U.S. Pipe has made some 10" diameter rolls which had 1" depth of chill on the radius. This means that if the milling company has both 9" and 10" diameter rolls it can make use of the undersize 10" diameter rolls by placing them in a 9" stand after making the necessary adjustments on the journals. This last certainly sounds ingenious, and it will be interesting to note if the procedure is practical.

Farrel Birmingham Co. has made a good static cast chill for many years and has one of the large roll shops in our country. They still prefer to furnish the static cast chills even though they have some equipment for centrifugal casting. They state that by employing constant metallurgical control they are able to furnish a uniform product to the trade.

Use of Chrome

Continental Foundry and Machine Co. has made statically cast chills for years. They call one of their chills, their "cromonite rolls." This roll has various percentages of chrome in the mix. Because of this chrome, they feel the rolls have better wearing qualities in grinding some materials. We have no idea how much flour has been ground on cromonite rolls. We sold a very limited few pairs and followed them in operation in the mills. As a result of those tests, we questioned the advisability of selling any more. They were more expensive than the standard chill and we could not see that they gave any extra service in a flour mill. You understand, of course, that scientifically we cannot state that the cromonite rolls do not have merit. To come to that conclusion, we would have to test several hundreds on various streams in a flour mill, and that is next to impossible.

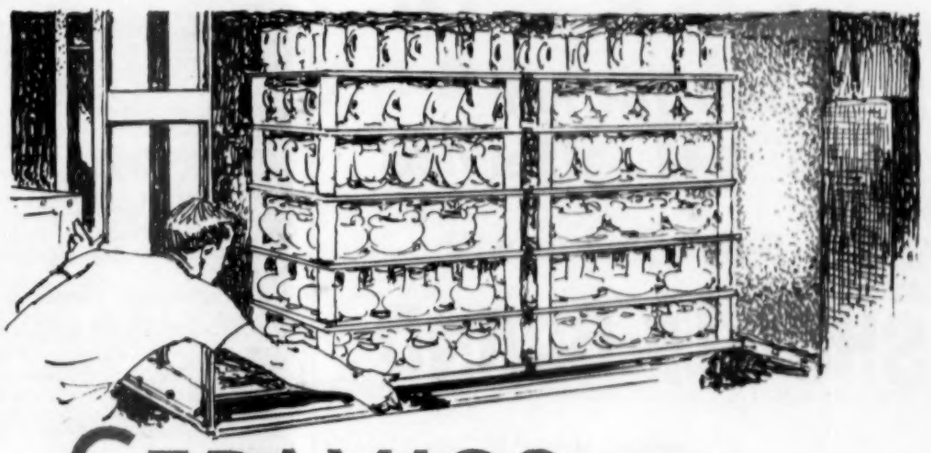
I have mentioned the four major manufacturers of chills in the U.S. We have also had experiences with four of European makes by E. R. & F. Turner in England.

They are static cast. They are good chills and they recommend a hardness range of 67-72 Shore Scleroscope. They feel a smooth roll must not be in the upper 70s for efficient grinding, and since most of the American mills use the same rolls for smooth, fine or coarse corrugations, they like to furnish rolls within the 72 Shore. The average depth of their chills is ½" on the radius.

Henry Simon, Ltd. of England favors the centrifugally cast chills, and they are licensed to make them by U.S. Pipe. They, as well as most of the European concerns recommend a softer roll than the average centrifugally cast chill made in the United States.

Buhler Bros. of Switzerland favors the static cast chill; but they have made or furnished some centrifugally cast ones in the United States.

MIAG of Germany makes only the static cast chill, and they recommend a softer roll for use as smooth rolls.



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In all this work, the basic materials must be sifted to uniform grades and the ceramic industry, like so many others, has turned to silk, SWISS SILK, to perform this delicate and critical operation.

Millers for over a century have relied on SWISS SILK for all their sifting problems, for there is no finer sifting textile made.

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The MIAG rolls as well as the Buhler rolls are cored larger in the center than at the ends, making what we might call a "modified hollow roll." In other words, a 36" length roll might have a 3" core 6" long at each end, and then a 5" diameter core in the center 24" length. They are machined both at the ends and centers before they are fitted for journals. Both the MIAG and Buhler chills have about ½" of chill.

The Turner chill has a small core going thru the roll as do the Simon, Allis Circle chills, U.S. Pipe chills, and the Continental chills. The Farrel Birmingham Co. chills are made solid and then bored at each end long enough for 6" to 8" length fits.

The two factors which affect the wear of any chill are the hardness and the toughness. Most manufacturers state they have no difficulty controlling hardness, and that it can be done to specifications. Toughness is an elusive characteristic. The physical structure which includes the density as well as the chemical content affects the toughness. In our shop, the Allis Circle and the U.S. Pipe chills cause the most wear on the carbide corrugating tools. Even very hard static cast chills as well as the centrifugally cast Simon chills are not as abrasive on our tools.

This could mean that the American made centrifugally cast chills are the toughest. The proof of this, however, is how each roll stands up or wears in your individual mill. Some of the milling companies are experimenting on this at the present time. It might be that one type or make of chill will work better on one stream while another will perform better on another stream. Some of our customers have run tests on this with new rolls which we have furnished—probably running Allis Circle chills on one of their first break streams, Farrel Birmingham Co. chills on another first break stream, and Turner chills on another stream. They have repeated the same thing on middlings and sizings. Unfortunately, not enough tests were made to arrive at any definite conclusions as far as flour mills are concerned.

—BREAD IS THE STAFF OF LIFE—

Pioneer Section, AACC, Discusses New Crop Wheat

ENID, OLKA.—New wheat crop quality received top consideration when over 40 members of the Pioneer Section, American Association of Cereal Chemists, met at the Youngblood Hotel, Enid, Okla., recently.

A tour of the new Union Equity quality testing laboratory and the Enid Board of Trade protein laboratory was conducted on the afternoon of Aug. 10.

At the business meeting on the morning of Aug. 11, James Mills, Kansas Milling Co., Wichita, presided. Lyle P. Carmony, Sterwin Chemicals, Inc., was program chairman, and Ralph Potts, Wichita Flour Mills, Wichita, was moderator of a panel reporting on new crop wheat quality.

Reports were given by the following: "New Crop Farinograph Curves," Mr. Potts; "Sedimentation and Viscosity," Eldon Smurr, American Flours, Inc., Newton, Kansas; "Analytical Tests Relative to Protein, Ash and Moisture," Lawrence Iliff, General Mills, Inc., Kansas City; "Malting Requirements," John Giertz, Kansas Milling Co., Wichita; "Oxidation and Bleaching Requirements," James Doty, Doty Technical Laboratories, Kansas City; "Extensograph Reports," George Schiller, Pillsbury Mills, Inc., Enid; "Baking Characteristics," Lester Fisher, Rodney Milling Co., Kansas City.

After the noon luncheon, Aug. 11, Dr. Elmer Heyne, Kansas State College, Manhattan, told of the climatic factors that affected the 1956 wheat crop. Mr. Smurr gave a report on the new Harvey land wheat with colored slides showing different shades of growth.

Visitors at the meeting were Gilbert Brunner of the Fargo, N.D., state experimental station, and John Meyers, milling engineer, Pillsbury Mills, Inc., Minneapolis.

The next meeting will be the Tri-Section meeting at Manhattan, Kansas, Oct. 5-6.

—BREAD IS THE STAFF OF LIFE—

Pfizer Earnings Up

NEW YORK—Sales and earnings of Chas. Pfizer & Co., Inc., for the first six months of 1956 were the highest for any similar period in the company's 107-year history.

The official earnings statement shows that net sales of $87,194,132 were up 10% from the $79,411,049 reported for the first half of 1955. Net earnings of $9,578,517 were 17% higher than the $8,152,764 for the first six months of 1955 and were equivalent, after payment of preferred dividends, to $1.77 per share of common stock against $1.58 last year.

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FOOD IRRADIATION

(Continued from page 5a)

theoretically and experimentally non-existent.

This is not to say that some types of radiation, such as neutrons, could not induce radioactivity. But for this very reason neutrons cannot be considered for food treatment. Only gamma radiation and accelerated electrons (cathode rays) are being considered for food irradiation, and with these sources at reasonable energy levels, induced radioactivity is not a problem.

There are, of course, regulations governing the uses of any new food process or additive. These regulations are enforced by the Food and Drug Administration, which regards irradiation as a food additive and, thus, requires proof of the wholesomeness of an irradiated food before it is placed on the market. Even without these regulations, however, those associated with development of the technique would require conclusive evidence as to the nutritional adequacy and non-toxicity of irradiated foods before any commercial application would be instituted. The concern of both food processors and the F.D.A. is sufficient to insure that no unsafe foods will be placed on the market.

Considerable effort is being expended at many laboratories throughout the country in an effort to find some means of preventing or reducing the objectionable effects of radiation. Several approaches have been investigated and some of these are as follows:

(1) Irradiation of food in the frozen state.

(2) Elimination of oxygen by evacuation, and replacement with inert gas.

(3) Use of chemical antioxidants which tend to inhibit oxidative changes.

(4) Use of free-radical-acceptors which have an affinity for the chief causative agents of chemical change.

Each of these methods has been slightly helpful in reducing radiation damage, but none has been sufficiently successful to indicate an early solution of the problem. On the basis of expected technological advances, however, it seems reasonable to expect some further progress. One important consideration which should not be overlooked is the increase in complexity and cost of the process which might be introduced by use of one of these methods.

The food irradiation research program which has been initiated at General Mills Research Laboratories is designed to evaluate the use of ionizing radiation as a processing technique. It is not viewed as a revolutionary method which will eliminate conventional procedures, but as a new tool which can aid in providing high quality foods with better keeping quality and more convenience at less cost to the consumer.

Although there are many problems associated with radiation preservation, and complete sterilization seems rather improbable, the several low-dose applications offer enough concrete promise to make the research effort well worthwhile. Furthermore, some important fundamental discovery may yet occur which will minimize some of the problems that now exist. (This kind of optimism has been responsible for a great many significant research gains.)

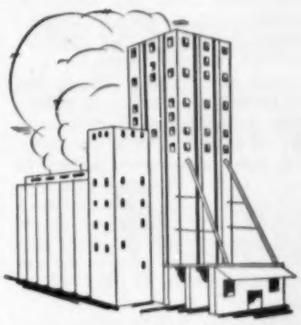
The program is directed at an investigation of the effects of radiation on various foods and their components, and toward a determination of dose requirements to achieve various preservation purposes. These efforts will be associated with a fundamental research phase which is aimed at an understanding of the mechanisms of radiation effects.

The program involves the knowledge, methods, and techniques of a number of related fields, including chemistry, physics, food technology, microbiology and others.

The radiation source (gamma radiation) in use for this study consists of about 4,000 curies of Cobalt 60. Although this source is equivalent to more than twice the activity of all the radium that has ever been isolated, it should be emphasized that it is only a research tool. Vastly greater dose rates would be necessary for commercial applications.

A gamma radiation source is especially well suited for a research program because of its ability to penetrate deeply. Thus, larger samples can be thoroughly irradiated than with other radiation sources.

Food samples to be irradiated are placed in any desirable package or container. The samples are then placed in a stainless steel, cylindrical irradiation chamber, and the cover is bolted on, making the chamber water-tight. The chamber is then lowered through the ten-foot water shield and is inserted into the source-holder, which contains six capsules of radioactive cobalt 60. Several chambers of different sizes are available for use in three source-holder configurations. This allows considerable versatility in terms of sample



How Does Weevil-Cide Stack Up?

In previous issues of this publication we have run a series of informational ads evaluating and comparing grain fumigants. Among other things, we pointed out the 8 basic requirements a grain fumigant should properly fulfill.

It is therefore only fair to ask, "How does Weevil-Cide check (✓) against these 8 basic requirements?" Here's the score:

1. Freedom from undue hazard to life or health under actual conditions of use. ✓
2. Positive warning properties. ✓
3. Non-flammability and non-explosiveness under practical conditions. ✓
4. That the fumigant leave no odor, residue or other harmful effect on the grain. ✓
5. Effectiveness at recommended dosages against both immature and adult insects, thus minimizing or preventing reinfestation. ✓
6. Simple and convenient application. ✓
7. Adaptability to use in widely varying types of grain storage units. ✓
8. True economy, meaning low unit cost for effective results. ✓

In short, Weevil-Cide meets every basic grain fumigant requirement.

What is more, while some other grain fumigants satisfy as many as 5, 6 or even 7 requirements, Weevil-Cide is the only product on the market which satisfies all 8 requirements.

THE Weevil-Cide COMPANY
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size and dose rate. Also, modifications for temperature change are possible.

In any given source-holder the radiation dose is dependent upon time only. Thus, the time required for any desired dose may be calculated on the basis of the source calibration. As an example of the time required for irradiation, a sample of a size approximately equal to one gallon would require slightly more than three hours for a dose of one million rep. At the end of the required radiation period the irradiation chamber is simply withdrawn from the source well. The samples may then be removed and the desired evaluation procedures may be carried out. Of course, there is a system of safety devices and an elaborate standard operating procedure which insure the safety of operating personnel and others in the vicinity.

SUMMARY

Although much research and many more extensive feeding studies must be carried out, most investigators feel that the chances are good that wholesomeness and nutritional quality of irradiated foods will prove acceptable.

The most serious problem to be overcome is the production of side-effects. Of these, the development of off-flavor is the most severe. (It might be noted at this point that canning has been a method of food preservation for more than 100 years. And yet, some foods still cannot be successfully canned, and many others are generally regarded as superior in the fresh or frozen state.)

However, some minor success has been achieved in attempts to reduce radiation damage, and it seems reasonable to expect further progress.

Since these side-effects either do not occur or are minimal with low doses of radiation, it is felt that such applications as the extension of refrigerated storage life and deinfestation will be the first commercial use of ionizing radiation in the food industry.

Irradiation can hardly be expected to have any substantial effect on conventional processing and distribution methods in the near future. But it does hold considerable promise in reducing food loss due to spoilage, of increasing food quality and convenience, and of decreasing costs of refrigeration, freezing and heat treatment.

—BREAD IS THE STAFF OF LIFE—

Purina to Build Mill in Mexico

ST. LOUIS — The Ralston Purina Co. has set up a subsidiary in Mexico for the manufacture and distribution of the full line of Purina Chows, it has been announced by Raymond E. Rowland, president.

A 23-acre mill site has been obtained at Queretaro, 162 miles north of Mexico City. Construction of a mill will commence in the near future. The subsidiary, Ralston Purina de Mexico SAdeCV, is capitalized at one million pesos.

In making the announcement, Rowland commended the Mexican government for its program to raise the standard of living in Mexico. "The Mexican government is doing a great deal to improve the supply of human food by encouraging the expansion and modernization of animal agriculture in Mexico," he said. "Livestock, poultry and dairy farmers are better informed than ever before. They are eager to use modern scientific rations and are capable of making good use of them."

The Ralston Purina Co. now has 41 mills in the U.S. and Canada. Three new mills are under construction in the United States.

—BREAD IS THE STAFF OF LIFE—

CHARTER GRANTED

COLUMBIA, S.C. — The State of South Carolina has granted a charter of incorporation to the Master Feed & Grain Co., Inc., of Orangeburg, a firm which proposes to carry on a storage elevator and warehouse business, to deal in grain, commercial livestock and poultry feeds and seeds and to raise and produce grains and seeds. Capital stock of $250,000 was authorized. A. D. Griffith is listed as president.

Construction to Start On New Hubbard Mill

MANKATO, MINN.—Contracts for construction of Hubbard Milling Co.'s new feed manufacturing plant at Cedar Rapids, Iowa, have been awarded, and construction work is already underway, according to an announcement by C. B. MacLeod, company president, Mankato.

While plans for construction of the new plant were announced in May, actual awarding of contracts and start of construction were delayed by a change in design necessitated when soundings were made on the plant site in southwest Cedar Rapids between the Crandic and North Western railroads near Hawkeye Downs.

Mr. MacLeod said contracts for construction of the plant have been awarded to the Abell-Howe Co., Chicago construction firm with a branch office in Cedar Rapids.

Plans for the mill were drawn by the T. E. Ibberson Co., Minneapolis, which will supervise the work of the general contractor.

Actual construction began on Aug. 20. First to be completed will be an office building and warehouse, expected to be ready for occupancy in November. The main plant will be completed and ready for operation in the spring of 1957.

Mr. MacLeod said the plant will be modern in every detail and will incorporate the latest equipment for automatic handling of ingredients and outgoing feeds and concentrates. Capacity of the plant will be about 500 tons a day.

The company manufactures Hubbard's Sunshine feeds and concentrates.

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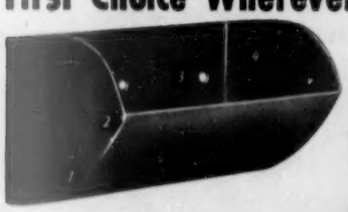

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MILLER DESCRIBES BOTH SYSTEMS

(Continued from page 1a)

of machinery without losing quality as American flour is world renowned, and also the great strides taken and being taken in mechanization and automation. As a European trained miller with both technical and commercial experience in Europe and also experience in quite a number of mills in the three main milling countries of South America, it was a very fine experience to see at first hand some of this capacity for getting things done, which has enabled the people of the U.S. to bring their standard of living to where it is today and I am quite sure that the milling community has had a big hand in bringing this about with its go-ahead and enlightened ideas.

Milling has such tremendous scope and even after years of experience a technician finds that there is always something more to learn or that there are often two or more ways to get the same result. Therefore no one can dogmatize or be too definite as the more one sees and learns the more one realizes that there is so much more to be learned. A miller or technician can only give his impressions and experiences knowing that in many cases other millers may have done the same thing in a different way and obtained the same result which is one of the wonderful things about milling and being a miller.

Taking Middle Road

One of the main points of discussion today wherever millers foregather is the comparison of American and European milling methods and the advantages and disadvantages of each system. It is a very controversial question and no miller would take it on himself to give a decision. The answer apparently is that each system is ideal for the country in which it is being used, and that through years of experience a system was evolved which satisfied the consumer needs of that particular country and gave commercial results which is, after all, what millers are in business for. However, as mentioned before, a miller can always learn more and this applies in a greater way to a system and, as such, each follower of either system should apply himself to learn all about the other and see where he can adapt and better his own system without necessarily altering its basic form and so improve both commercially and technically.

In order to demonstrate this, one must mention one's own experiments and experiences which in this case were carried out at our new mill, ANACONDA, in Brazil. I have always felt that more capacity should be taken out of machinery — in other words more on the American system, but still not lose quality.

In our case it was somewhat easier as we started from scratch and even though we bought European machinery, which I consider as good as any in the world and conformed more or less in the diagram to European standards, we were able to look ahead to a certain extent and prepare for this experiment of trying to adjust a European standard mill to American capacity standards and at the same time insure no loss of quality. We tried to take the middle road by taking the advantages of both systems and putting them together, but we had to be prepared to switch back to the normal standards usually used on English machinery in case we encountered any unforeseen difficulties.

As it will be appreciated, this had to be done slowly in order to be able to stop if the quality suffered. It took approximately a year from the time of starting up for us to be able to say that the experiment was a success. We had bought an European standard type of flour mill for 240-250 tons of wheat a day with a guaranteed maximum pneumatic capacity of 280 tons a day. This same machinery is now doing 480 to 500 tons of wheat a day with no loss of quality and with no additional machinery, apart from extra packing machines which we had to get to keep up to the double production. One of the amazing points is that the pneumatic is taking less power now at 480-500 tons a day than it was at 250 tons a day and we have the same number of fans as before. The total power on pneumatic for 75 lifts is 180 HP which is satisfactorily compared with an elevator mill of the same capacity.

It has often been said that one of the reasons that the American system is able to get such high capacity is because of the good wheat available and that American millers do not have the variation of different qualities of wheat from all over the world which European and South American millers have to use.

That is a point, but we have in ANACONDA proved to our satisfac-

Advertisement

INSIDE SCIENCE

The Vital Story of Vitamin B_1

(Thiamine)

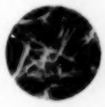
by Science Writer

History. The discovery of vitamin B_1 resulted from research into the cause of beriberi. Almost 50 years passed between Eijkman's discovery of the relationship of the disease to diet and the famous work of Jansen and Donath who first isolated the crystalline vitamin from rice bran.

Within ten years of that first isolation the vitamin's chemical structure was determined and it was successfully synthesized.

Eijkman's work resulted in the development of a theory that beriberi was caused by a lack of some factor in the diet and not by a toxin or infectious agent. This idea was not readily accepted until the growth of dietary knowledge proved it correct.

Isolation and Synthesis. In 1926 Profs. Jansen and Donath accomplished the isolation of crystalline vitamin B_1 from rice bran. In 1931 Windaus and co-workers successfully isolated pure vitamin B_1 and established its empirical formula. In 1936 R. R. Williams, and independently R. Grewe, explained the vitamin's chemical structure. That year, R. R. Williams and J. K. Cline accomplished the synthesis of thiamine which is in wide use today. Andersag and Westphal also synthesized the vitamin in 1936. Another synthesis was described by Bergel and Todd in 1937.



Photomicrograph of B_1 crystals

Chemical and Physical Properties. Thiamine hydrochloride is white, water soluble, with a nut-like, salty taste and yeast-like odor. Its empirical formula is: $C_{12}H_{17}ClN_4OS \cdot HCl$. Thiamine produced by synthesis is identical chemically and in biological activity with that obtained in pure form from nature.

Deficiencies. A deficiency of thiamine is characterized by these symptoms: depression, irritability, fearfulness, lack of initiative and interest, loss of appetite. Symptoms vary since in usual practice deficiencies of other water-soluble vitamins occur. Medical treatment is simple: a sufficient amount of thiamine is administered to relieve symptoms quickly and the physician provides for a continuing adequate intake.

Beriberi victim

A severe deficiency of thiamine leads to beriberi, a serious and sometimes fatal disease. While beriberi is almost a medical curiosity in the United States, it is common in countries in which polished white rice is a staple of the diet.

Human Nutrition Requirements. Thiamine is one of the nutritive elements the human body needs daily and does not store in quantity. The minimum daily requirements established by the U. S. Food and Drug Administration for the prevention of symptoms of thiamine deficiency disease are:

Adults	1.00 mg.	Children (1-5 incl.)	0.50 mg.
Infants	0.25 mg.	Children (6-11 incl.)	0.75 mg.

The Food and Nutrition Board of the National Research Council recommends the following dietary intake of thiamine for healthy persons in the U. S. A.

Recommended Daily Intake in Milligrams

Age	*Men*	*Women*
25	1.6	1.2
45	1.5	1.1
65	1.3	1.0
Pregnant (3rd trimester)		1.5
Lactating		1.5

The Council recommendations for infants and children vary below and above these figures, based on age and sex. Various illnesses and stress situations can exhaust vital reserves of thiamine. So, for the physician, vitamin B_1 is prepared in various dosage forms and potencies for therapeutic and prophylatic use.

How do human beings receive thiamine? It is widely distributed in foods of animal and vegetable origin, particularly cereal grains and dry legumes. Because of public demand for refined products which millers must meet for obvious economic reasons, a loss of thiamine and other factors occurs during processing. The thiamine loss is overcome through the use of *enrichment* in cereal grain products for which Federal Standards exist, or in other foods such as breakfast cereals, by *fortification* or *restoration*. When enriching, fortifying or restoring, the food processor adds the necessary amount of pure thiamine (and other vitamins and minerals) to the food so that the finished product meets Federal, state and territorial requirements or contributes to the consumer an amount of the vitamin which dietary experts believe significantly useful.

Thiamine is extensively used for the enrichment of cereal grain foods such as white flour, white bread and rolls, macaroni products, farina, corn grits and meal, milled white rice. The story of these uses is delightfully told in a separate brochure which is available on request for reference or educational purposes.

Production. Huge production facilities at the Hoffmann-La Roche plant in Nutley, New Jersey, deliver highest quality thiamine *by the tons*. Roche manufactures thiamine hydrochloride and thiamine mononitrate. These fine products, which equal or exceed U.S.P. specifications, are ideal for use by pharmaceutical makers and food processors. Years of experience in research and manufacture have made Roche the leader in vitamins.

This article is published in the interests of pharmaceutical manufacturers, and of food processors who make their good foods better with essential, health-giving vitamin B_1. Reprints of this and others in the series are available on request. Write the Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey. In Canada: Hoffmann-La Roche Ltd., 286 St. Paul Street, West; Montreal, Quebec.

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tion that we can adapt a part of the American system of high capacity to our machinery and still get the results and quality we require, even with the variation of wheat that we receive, which vary from soft wheats of high humidity and low bushel weights to good quality Argentine and American wheats. It appears that we should strive as commercial millers (and we must always remember that our first duty is to see that a mill is a success financially) to obtain as great a capacity as possible out of a machine within its life range so as to get the maximum out it before replacing it, always remembering that there are new ideas being brought out every year and that after a certain number of years a machine is obsolete and no longer worth its keep; in fact, it is a debit and should be replaced, having given all it could during its lifetime, but we should be sure that we have received the maximum work out of the machine during the depreciation time allowed. This depends on each individual milling firm and the regulations of the country as to how much depreciation is allowed.

Capacity vs. Technique

I have spoken here of the advantage of the American system of high capacity but I must now mention the other side which is the high technique of the European system and the way in which the Europeans have brought their milling technique to a fine art, maybe too fine in that it is inclined to get too long and too cumbersome but we can be very proud of the machines which are being made in Europe, with their modern lines, and their automatic efficiency which is a great credit to the European engineers. There is no doubt that Simons, Robinson, MIAG & Buhler have all done a tremendous amount towards finer and better milling. The solution appears to be to put in European machinery plus certain diagramatic flows and adapt them to the flows and high capacity of the American system which is what we have more or less tried to do at ANACONDA. We are very pleased with the results and feel that most European machinery can be adapted to this type of milling giving a much greater return. Please note that the names of the four milling engineers mentioned above are not put in any particular order or prominence.

Regarding future trends this will have to be generalized as it is far too big a subject to be discussed properly in this article. The impression received in Dallas and during the trip through Minneapolis, Buffalo, Toronto, and New York, was the need for simplification, mechanization and automation.

For instance, we still do not know enough about the tempering and conditioning of wheat though sterling work is being done on this subject by the milling engineers. Dr. Werner Schafer of the Federal Research Institute of Cereal Industry, Detmold, Germany and Dr. H. Gehle, MIAG, Western Germany gave most constructive and interesting papers at Dallas. It is felt that not enough attention has been given to wheat cleaning and conditioning which, in some mills, is just the barest necessity to get the wheat fairly clean to the 1st. Break. Then after the 1st. Break we have quite a complicated diagram or flow to try and get good flour yield and good quality from a wheat that maybe is not one hundred percent cleaned or tempered.

Apparently we are putting the cart before the horse. First let's get the wheat in optimum condition for opening up, for milling, know how we do it, and thus simplify our milling problems in the mill itself. We open up the wheat on rolls and by doing so require purifiers afterwards to clean up the damage we have already done in order to make a flour of good yield and quality so it appears that we should try and improve our wheat cleaning and tempering department and thus simplify our mill department.

Mechanization

Mechanization is already being well developed and has been by both European and American millers. Bulk storage is becoming very popular and is in use in many mills. In ANACONDA we have found it very useful and satisfactory. From this comes the necessity for high speed packing when selling in sacks. For example, in ANACONDA we do not pick any particular load until the truck arrives at the main gate and hands in the order to the office which is immediately communicated to the packing floor. While the truck is backing into place, the packers are already functioning. In order to be ahead we also have eight double spirals which are already full of various qualities of flour and which carry up to 500 to 600 sacks ahead of the trucks and as the bags descend on to the truck the packing machines replace them in the spirals. This avoids a tremendous amount of labor and handling. From this point one can go on a step further to delivery in bulk trucks and wagons, which has become quite a common form of delivery in the U.S., once again saving labor and handling costs and having the advantage of being much more hygienic. I believe Europe has also taken this bulk delivery up seriously, for instance a mill in England of which I am a director has already got one of Henry Simons' bulk flour trucks.

Here in South America the bakers are not ready as yet, but it should come in the not too distant future.

Automation

Automation in a flour mill today is confined generally to individual machines such as high and low level bin indicators, automatic feed regulators and synchronization of series of machines to insure stoppage and prevention of chokes. Every day this

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type of automation is being increased, but we are no nearer real automation or the automation of a mill in general. Someone may say this is impossible! Why? Because of all the spouts in a mill. Because of all the drives and shafts in a mill. And many other reasons such as the setting of rolls.

I agree in present day mills it would be too costly and practically impossible. But not necessarily in the mill of the future! We should strive to improve our wheat tempering as mentioned before in order to simplify our mill diagrams and flours. In other words, not so many spouts in a flow so as to be able to have central control. Do away with the possibility of chokes, or at least be able, through a central automatic control, to catch them when they start.

Shafting and belting could be done away with, only individual drives on all machines, all controlled from the same central panel. From here we go to the adjustment of rolls etc., which can be controlled by heat regulation and the use of thermometers all shown on a central panel. One or two mills have already experimented with this type of control of grinding and the results are very interesting. I saw one of these tests while in the U.S.

Here in ANACONDA we have already taken one step forward with the abolition of all shafting and drives by using all individual drive motors with ammeters, and we are very satisfied with the results. With capacitors today, the usage of power can be very well controlled. Also one of the great advantages is in knowing exactly what power every individual machine is taking in the mill especially the rollermills which is of tremendous benefit, getting away from the old adage "if it won't drive put a bigger belt on or tighten it up more." How much extra power is used up in this way.

The day can come when, with a one or two story mill building, one man at a central control panel, say on the roller floor, and the miller plus a helper, the whole mill can be run, especially a pneumatic mill which, when properly set, should be nonchokable and using individual drives etc. This also can be applied to the wheatcleaning.

All this may seem very farfeteched but if we gradually improve our milling conditions and problems, we can go a long way to an automatic mill.

For example, feed mills, not so long ago, never dreamt of automation and today there is as an example —the feed plant of the Inter-Country Farmers Cooperative Assn., at Woodridge, N.Y., which is a very fine example of what automation can do. It could be said that feed milling is simpler then flour milling, but what can be done in one line can be done in another if properly adapted.

EVALUATION

(Continued from page 10a)

origin may be regarded as known, the protein content is quite suitable to individually characterize the different lots. Protein contents higher than 14% (N x 6.25) are highly estimated in all grain importing countries owing to the high blending value of such wheats.

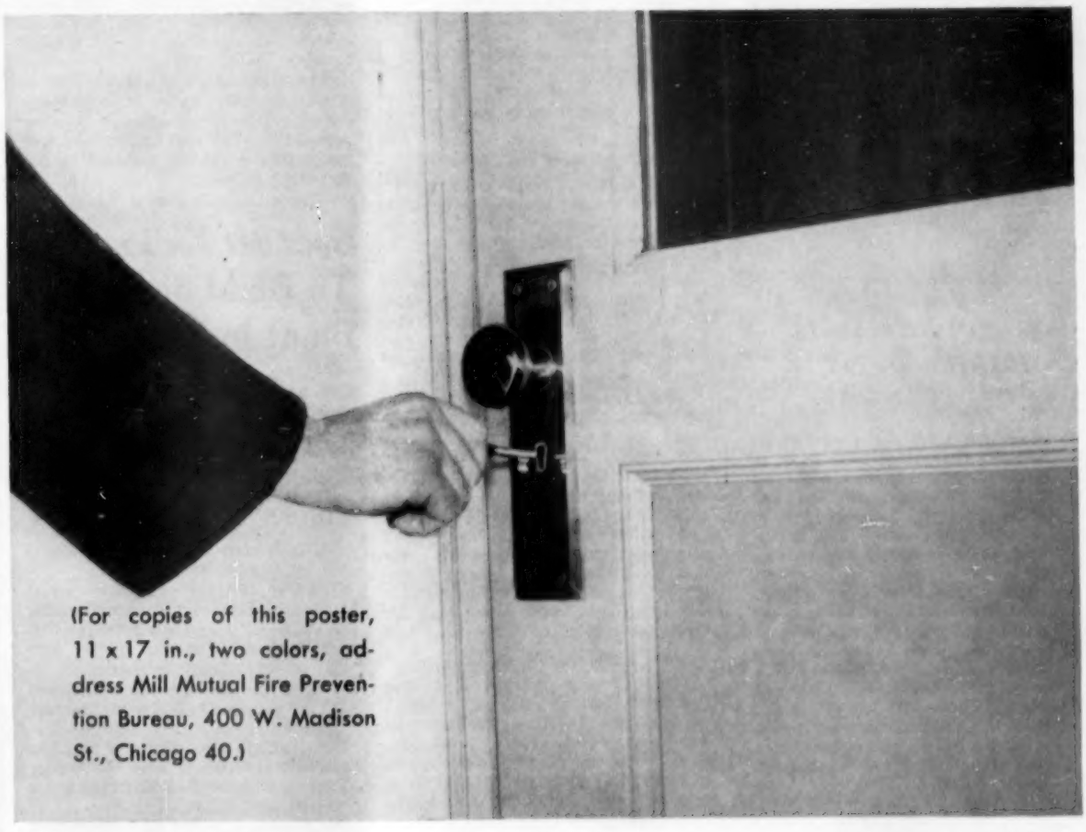
An evaluation by gluten content and gluten quality meets now with insurmountable difficulties. The practical usefulness of the sedimentation test by Zeleny is being controlled. With regard to the North American Standards, nearly all grain importing countries wish for a greater differentiation of the sub-grades.

The evaluation of moisture content is particularly interesting for Central European wheats. The matter is to combine the factors of resistance to storage, of moisture content for grinding and costs of drying in such a way that the farmer will not have unbearable expenses because of our own damp climate, but that the consumer should be obliged to buy water at the price of wheat. The basis of 15%, and a fair portion of the drying costs if the moisture content is above 16%, is a way toward achievement.

The extreme limits for impurities admissible independent of the characteristics of the regional production will have to be fixed so that the producer will be compelled to offer of his own accord a highly cleaned grain. The impurities have to be removed on the spot where they will be used. Proportions of 3% for foreign material, 1% for germinated wheat and 1% for smut must not be overreached.

Finally, we wish to point out specifically that it is a very normal development long ago foreseen that sufficient account should be kept of the technological aspects. This conception has nothing in common with the discrimination of national production or the restriction of free trade. It is quite natural that the grower should see the cereals from quite a different angle than the consumer. But there are legitimate facts which cannot be denied longer, and the primordial duty of the cereal industry and the applied cereal science should be to give suitable form to this postulate common to technical and economic wisdom.

DON'T LOCK FIRE IN THE PLANT



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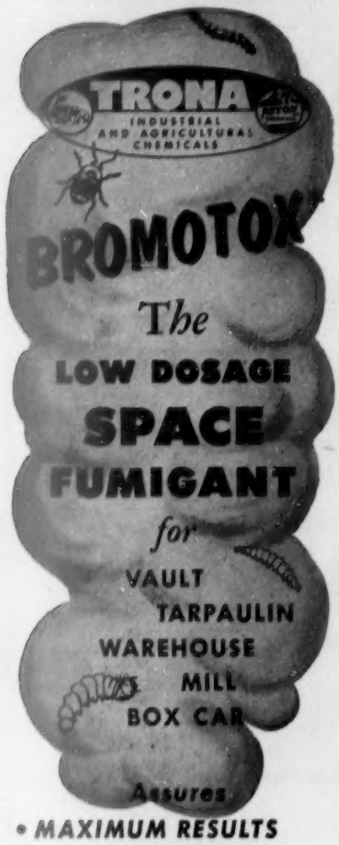

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U.S. ENGINEER

(Continued from page 1a)

the American type they conceded its superiority.

Purifiers

As to purifiers, Europeans in their designs have laid great stress on air control. The result is a possibility of air eddies and most important of all under our sanitation laws lack of attention to bug harbors. The American purifier is usually a more simple machine for the work to be done and one which provides the utmost in sanitation; in fact, all through the American designs it appears greater importance has been put on sanitation due to our pure food laws than anywhere else in the world.

European milling machinery lends itself best to mill buildings which cover a wide expanse of ground. The American machinery is best adapted to buildings of lesser ground area, and with a greater number of floors. Thus the American system tends to take greater advantage of gravity, requires fewer elevators, and makes possible a considerably less expensive building.

Conveying of Mill Streams

Both European and American practice in handling the mill streams is fast changing to air handling. It replaces the grouping of elevators as practiced in Europe and the American practice of putting all elevators on one common shaft. The handling of mill streams by air is a big step forward in combating infestation and in the cleaning department provides a cleaning system of its own.

There is no advantage in the quality of product produced with one system over the other. Quality of flour produced is determined largely by the percentage of extraction and the two systems are equally capable in this respect. Much depends upon the kind of flour desired. In Europe there is a large demand for very low grade flour, and Europe will probably continue to make flour for human consumption that would be used for stock feeding in the U.S.

Cleaning of Grain

The European system of milling has been worked out over a period of years and lends itself to European conditions, which are quite different from American, as Europe draws wheat from all parts of the world and has wheat cleaning and conditioning problems that do not confront America. It should be mentioned, however, that American grain cleaning equipment has found its way all over the world. It is usually the practice in Europe to wash wheat, and wheat washers and conditioners built by all manufacturers in Europe are practically the same in that they use a very large amount of water. American washing machines are designed to use much less water, and there is some difference of opinion as to the merits of these two types of machines. Because the European machine uses large quantities of water, it is necessary to follow the washing with a drying and tempering system. This is usually accomplished in wheat conditioning equipment. American practice has been to store grain in bins and to allow for a greater period during which time nature attends to the job of conditioning or tempering.

European mills are usually rated by 'tons input" (usually long tons), whereas the American mills are rated on hundredweight (cwt.) output. This is a point which must be carefully watched. It can readily be seen that the rating of a plant in output makes it difficult to guarantee a capacity as the amount of flour obtainable from wheat varies from one year to the next. In other words, we might have heavy wheat one year, and at another time, light wheat with a great deal of fiber and outer coatings.

Maintenance and Lift of Equipment

While there are no specific figures available on maintenance costs, comparisons made decidedly favor the American machinery due to its simplicity in design and its rugged construction. Today American manufacturers are furnishing repairs for machines built as long ago as 1889 and which have been in continuous use since date of installation.

In closing, it should be emphasized that while American machinery usually costs more than the European for the same capacity, the size and cost of the building offset this disadvantage. Owing to the small number of units used in the American system, installation costs are usually lower.

Simplicity and accessibility of American design mills have been an important feature of design to compensate for the high labor cost and continuous operation required by the American miller.

—BREAD IS THE STAFF OF LIFE—

Spencer Kellogg To Build Soybean Plant in Minnesota

BUFFALO, N.Y.—Spencer Kellogg & Sons, Inc., announced it has purchased property near Breckenridge, Minn., for the construction of a new soybean and flaxseed processing plant and storage elevator.

The project, costing between $5 and $6 million, will be started next spring. A 2,500,000-bu. elevator will be built first. It is scheduled to be in operation by August, 1957.

Spencer Kellogg executives said Minnesota now ranks second among the states as a soybean producer and that there are "not too many" soybean crushing facilities there.

Previously the company disclosed that it had been considering building a processing plant in the Minnesota-North Dakota area. The site that has been selected now is near the border of the two states. Breckenridge has a population of 3,600.

So that it can get into immediate production in Minnesota, the company said it has concluded an agreement to share the newly expanded processing and refining facilities of the Honeymead Products Co. at Mankato, Minn., south of Minneapolis.

"This will give us immediate, completely national distribution of our soybean products and help us process our usual percentage of the steadily increasing soybean production by American farmers," Howard Kellogg, Jr., company president, said.

The new Honeymead soybean extraction unit has passed its trial period, it has been announced by L. W. Andreas, president of that firm. The unit is said to be the largest ever built, with a rated capacity of 1,200 tons—or approximately 2,000 acres of soybeans per day.

Spencer Kellogg now has plants at Bellevue, Ohio; Chicago; Decatur, Ill.; Des Moines, Iowa; Edgewater, N.J.; El Centro, Cal.; Long Beach, Cal., and Minneapolis. It also has a new research center in Cheektowaga, a Buffalo suburb.

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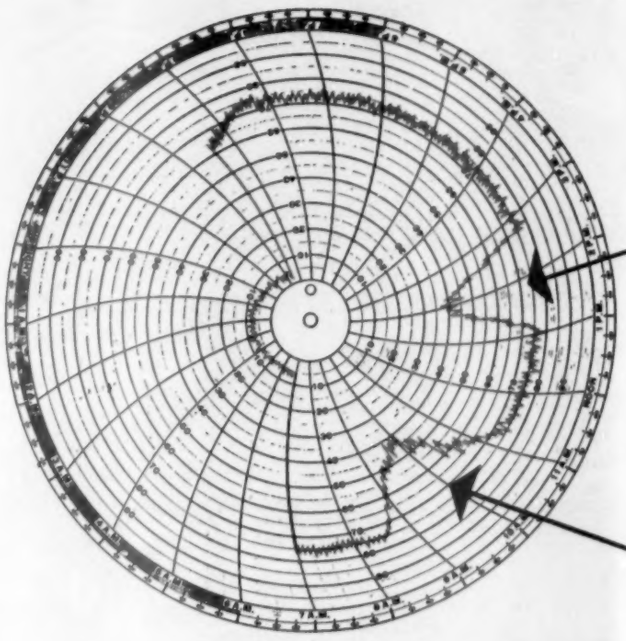

these mean trouble...

IT MIGHT BE a broken belt, a torn sieve, or a choke-up somewhere in the spouting.

But... no matter *what* causes the flow variation in the flour stream ... it's spotted the INSTANT it happens. One look at the graphic recorder operated from the W&T Massometer or Merchen Scale Meter tells the story. Even the smallest momentary fluctuations in flow rate are detected immediately and recorded accurately by these mill "watch dogs."

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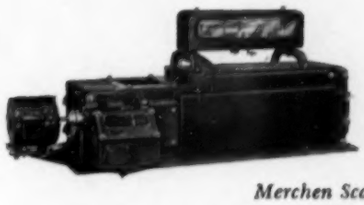

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